

What Is Claimed Is:

1 Claim 1. A solid-state scanning microscope, comprising:
2 a source of collimated radiant energy for illuminating a sample, the sample
3 having a first side and a second side, the radiant energy illuminating the first side of the
4 sample;
5 a plurality of narrow angle filters comprising a microchannel structure to permit
6 the passage of only unscattered radiant energy through the microchannels, the
7 microchannel structure having a first end and a second end, the first end of the
8 microchannel structure placed near the second side of the sample on the side opposite
9 the source of radiant energy, some portion of the radiant energy entering the
10 microchannels from the sample;
11 a solid-state sensing array comprising a plurality of sensing elements attached to
12 the second end of the microchannel structure, the sensing elements being sensitive to
13 radiant energy, a plurality of the microchannels being aligned each to correspond with
14 an individual sensing element of the solid-state sensing array,
15 wherein that portion of the radiant energy entering the microchannels
16 that is parallel to the microchannel walls travels to the corresponding sensing elements
17 generating electrical signals that can enable an image to be reconstructed by an external
18 device; and
19 a planar luminescent material layer for converting higher frequency radiant
20 energy into a detectable range for the solid-state sensing elements, the luminescent
21 material layer being inserted between the solid-state sensing array and the second end of
22 the microchannel structure.

1 Claim 2. A system as in one of Claim 1,
2 wherein the radiant energy is X-Ray radiation.

1 Claim 3. A solid-state scanning microscope, comprising:
2 a source of collimated radiant energy;
3 a plurality of narrow angle filters comprising a microchannel structure to permit
4 the passage of only unscattered radiant energy through the microchannels, the

5 microchannel structure having a first end and a second end;
6 a solid-state sensing array comprising a plurality of sensing elements, attached at
7 the first end of the microchannel structure, the sensing elements being sensitive to
8 radiant energy, a plurality of the microchannels being aligned each to correspond with
9 an individual sensor element of the solid-state sensing array;
10 a planar member of an optically conductive material suitable for conducting
11 radiant energy, the planar member having a first side and a second side, the first side of
12 the planar member being placed perpendicular to the second end of the microchannel
13 structure and attached to the microchannel structure allowing for an air-gap between the
14 planar member and the microchannel structure;
15 an index matching fluid placed adjacent to the second side of the planar
16 member, the index matching fluid being matched to the index of the planar member, the
17 index matching fluid continuously filling the region between the surface of the sample
18 and the second side of the planar member; and
19 a prism placed upon the planar member so as to conduct the source of radiant
20 energy operatively into the planar member, the radiant energy being reflected by the
21 first side and not reflected by the second side of the planar member, the radiant energy
22 escaping the second side of the planar member to illuminate the surface of the sample,
23 some portion of the radiant energy being reflected by the sample to enter the
24 microchannels, that portion of the radiant energy entering the microchannels that is
25 parallel to the microchannel walls travels to the solid-state sensing elements to generate
26 electrical signals that can enable an image to be reconstructed by an external device.

1 Claim 4. The solid-state scanning microscope of Claim 3,
2 wherein the radiant energy is laser light radiation.

1 Claim 5. The solid-state scanning microscope of Claim 3,
2 wherein the radiant energy is visible light radiation.

1 Claim 6. The solid-state scanning microscope of Claim 3,
2 wherein the source of radiant energy is a solid-state emitter.

1 Claim 7. A solid-state microscope, comprising:
2 a plurality of narrow angle filters comprising a microchannel structure to permit
3 the passage of only unscattered radiant energy through the microchannels, the
4 microchannel structure having a first end and a second end;
5 a solid-state sensing array comprising a plurality of sensing elements, attached at
6 the first end of the microchannel structure, a plurality of the microchannels being
7 aligned each to correspond with an individual sensing element of the sensing array;
8 a plurality of solid-state emitters for emitting radiant energy mounted on the
9 second end of the microchannel structure, the emitters illuminating the surface of a
10 sample, some portion of the radiant energy being reflected by the sample to enter the
11 microchannels, that portion of the radiant energy entering the microchannels that is
12 parallel to the microchannel walls travels to the sensing elements to generate electrical
13 signals that can enable an image to be reconstructed by an external device; and
14 a transparent planar member adjacent to the second end of the microchannel
15 structure, the transparent covering containing conduction paths to conduct power to the
16 solid-state emitters, the transparent cover protecting the second end of the microchannel
17 structure from damage and preventing the entrance of foreign objects into the
18 microchannels.

1 Claim 8. The solid-state scanning microscope of Claim 7,
2 wherein the solid-state emitters are Light Emitting Diodes.

1 Claim 9. The solid-state scanning microscope of Claim 7,
2 wherein the solid-state emitters are Light Emitting Polymers.

1 Claim 10. A solid-state microscope, comprising:
2 a source of collimated radiant energy;
3 a narrow angle filter comprising a microchannel to permit the passage of only
4 unscattered radiant energy through the microchannel, the microchannel having a first
5 end and a second end;
6 a solid-state sensing element, attached at the first end of the microchannel, the
7 microchannel being aligned with the sensing element; and

8 a polarizing beam splitting element having a partially reflective inner surface,
9 the polarizing beam splitting element being inserted between the second end of the
10 microchannel and a sample, the polarizing beam splitting element having a first side, a
11 second side, and a third side, the first side being attached to the second end of the
12 microchannel,
13 wherein the second side of the polarizing beam splitting element is
14 perpendicular to the sample and receives the collimated radiant energy, the third side
15 being adjacent to the sample and directing a portion of the internally reflected
16 collimated radiant energy to the sample and receiving some portion of the radiant
17 energy reflected by the sample, the third side being opposite the first side, the first side
18 directing some portion of the sample reflected radiant energy to enter the microchannel,
19 some portion of the radiant energy being reflected by the sample to enter the
20 microchannel, that portion of the radiant energy entering the microchannel that is
21 parallel to the microchannel walls travels to the sensing element to generate an
22 electrical signal that can enable an image to be reconstructed by an external device.

1 Claim 11. The solid-state scanning microscope of Claim 10,
2 wherein the radiant energy is laser light radiation.

1 Claim 12. The solid-state scanning microscope of Claim 10,
2 wherein the radiant energy is visible light radiation.

1 Claim 13. The solid-state scanning microscope of Claim 10,
2 wherein the source of radiant energy is a solid-state emitter.

1 Claim 14. A solid-state microscope, comprising:
2 a source of collimated radiant energy, the source of collimated radiant energy
3 being X-Ray radiation;
4 a narrow angle filter comprising a microchannel to permit the passage of only
5 unscattered radiant energy through the microchannel, the microchannel having a first
6 end and a second end;
7 a solid-state sensing element, attached at the first end of the microchannel, the

8 microchannel being aligned with the sensing element;
9 a planar luminescent material layer for converting higher frequency radiant
10 energy into a detectable range for the solid-state sensing elements, the luminescent
11 material layer being inserted between the solid-state sensing array and the first end of
12 the microchannel structure;
13 a beam splitting element having a partially reflective inner surface, the
14 polarizing beam splitting element being inserted between the second end of the
15 microchannel and a sample, the beam splitting element having a first side, a second
16 side, and a third side, the first side being attached to the second end of the
17 microchannel,
18 wherein the second side of the beam splitting element is perpendicular to
19 the sample and receives the collimated radiant energy, the third side being adjacent to
20 the sample and directing a portion of the internally reflected collimated radiant energy
21 to the sample and receiving some portion of the radiant energy reflected by the sample,
22 the third side being opposite the first side, the first side directing some portion of the
23 sample reflected radiant energy to enter the microchannel, some portion of the radiant
24 energy being reflected by the sample to enter the microchannel, that portion of the
25 radiant energy entering the microchannel that is parallel to the microchannel walls
26 travels to the sensing element to generate an electrical signal that can enable an image
27 to be reconstructed by an external device; and
28 a waveguide for conducting the source of radiant energy to the second side of
29 the beam splitter.

1 Claim 15. A solid-state microscope, comprising:
2 a scanning stage for providing structural support for moving the microscope, the
3 scanning stage having a first side and a second side;
4 a solid-state emitter for radiating energy, the emitter having a first side and a
5 second side, the first side of the emitter radiating energy, the second side of the emitter
6 mounted to the first side of the scanning stage;
7 a waveguide having a first end, a second end, and an internally reflective
8 surface, the first end of the waveguide being attached to the second side of the solid

9 state emitter allowing radiant energy from the solid-state emitter to enter into the
10 waveguide to be reflected by the internally reflective surface, the reflected radiant
11 energy exiting at the second end of the waveguide;

12 a narrow angle filter comprising a microchannel to permit the passage of only
13 unscattered radiant energy through the microchannel, the microchannel having a first
14 end and a second end;

15 a beam splitting element adjacent to the second end of the waveguide and near a
16 sample, the beam splitting element having a first side, a second side, and a third side,

17 wherein the first side of the beam splitting element is perpendicular to
18 the sample and receives the reflected radiant energy from the waveguide and conducts
19 the radiant energy to exit the second side of the beam splitting element, the second side
20 of the beam splitting element being adjacent to a sample and directing a portion of the
21 radiant energy to the sample and receiving some portion of the radiant energy reflected
22 by the sample, the third side of the beam splitting element being opposite the second
23 side of the beam splitting element and adjacent to the second end of the microchannels,
24 the third side of the beam splitting element directing some portion of the reflected
25 radiant energy to enter the microchannels, some portion of the radiant energy being
26 reflected by the sample to enter the microchannel; and

27 a solid-state sensing element having a first side and a second side, the sensing
28 element detecting radiant energy from the first side, the second side of the sensing
29 element mounted to the first side of the scanning stage adjacent to the solid state
30 emitter,

31 wherein that portion of the radiant energy entering the microchannel that
32 is parallel to the microchannel walls travels to the sensing element to generate an
33 electrical signal that can enable an image to be reconstructed by an external device.

1 Claim 16. The solid-state microscope of Claim 15,
2 wherein the beam splitting element has a polarizing filter.

1 Claim 17. A color solid-state scanning microscope, comprising:
2 a scanning stage for providing structural support for moving the
3 microscope, the scanning stage having a first side and a second side;

4 a plurality of solid-state emitters for radiating energy, the wavelength of radiant
5 energy of a predetermined number solid-state emitters is of at least two substantially
6 different wavelengths, each emitter having a first side and a second side, the first side of
7 each emitter radiates energy, the second side of each emitter is mounted to the first side
8 of the scanning stage;

9 a plurality of waveguides, each waveguide having a first end, a second end, and
10 an internally reflective surface, the first end of each waveguide being attached to the
11 second side of a solid state emitter allowing radiant energy from the solid-state emitter
12 to enter into the waveguide to be reflected by the internally reflective surface, the
13 reflected radiant energy exiting at the second end of the waveguide;

14 a plurality of narrow angle filters comprising a microchannel structure to permit
15 the passage of only unscattered radiant energy through the microchannel, the
16 microchannel having a first end and a second end;

17 a plurality of beam splitting elements, each beam splitting element adjacent to
18 the second end of the waveguide and near a sample, the beam splitting elements each
19 having a first side, a second side, and a third side,

20 wherein the first side of each beam splitting element is perpendicular to
21 the sample and receives the reflected radiant energy from the waveguide and conducts
22 the radiant energy to exit the second side of the beam splitting element, the second side
23 of the beam splitting element being adjacent to a sample and directing a portion of the
24 radiant energy to the sample and receiving some portion of the radiant energy reflected
25 by the sample, the third side of the beam splitting element being opposite the second
26 side of the beam splitting element and adjacent to the second end of the microchannels,
27 the third side of the beam splitting element directing some portion of the reflected
28 radiant energy to enter the microchannels, some portion of the radiant energy being
29 reflected by the sample to enter the microchannel; and

30 a plurality of solid-state sensing elements, each solid-state sensing element
31 having a first side and a second side, the sensing element detecting radiant energy from
32 the first side, the second side of the sensing element mounted to the first side of the
33 scanning stage adjacent to the solid state emitter,

34 wherein that portion of the radiant energy entering the microchannel that

35 is parallel to the microchannel walls travels to the sensing element to generate an
36 electrical signal that can enable an image to be reconstructed by an external device.

1 Claim 18. The color solid-state scanning microscope of Claim 17,
2 wherein a predetermined number of beam splitting elements have a
3 polarizing filter.

1 Claim 19. A method of scanning an array of sensing devices over a sample,
2 comprising the steps of:
3 applying an array of sensing devices to a sample, the array of sensing devices
4 being composed of individual sensing elements arranged in a fixed pattern relative to
5 each other;
6 rotating the array of sensing devices a predetermined amount about an axis
7 perpendicular to the plane containing the array of sensing devices; and
8 traversing a linear scan path over the sample with the array of sensing devices,
9 the individual sensing elements tracing parallel paths, the distance between the parallel
10 paths being determined by the rotation of the array of sensing devices and the relative
11 position of the individual sensing devices in the array, the parallel paths being non-
12 overlapping, partially overlapping, or completely overlapping other parallel paths.

1 Claim 20. The method of Claim 19,
2 wherein the array of sensing devices is a 1-dimensional, linear array.

1 Claim 21. The method of Claim 19,
2 wherein the array of sensing devices is a 2-dimensional, planar array.